SMITH INTERNATIONAL, INC

TO: *Ron Eyre*
David Truax
Kesh Keshavan

Combine w/ 97-ME60

FROM: *Monica Landry* ML

DATE: *February 9, 1998*

SUBJECT: ***CONCEPT NO. 98-ME8***
Cutting Element With A Canted Design For Improved Braze Contact Area, Lower Residual Stress, Improved Interfacial Stress And Better Impact Resistance

Thank you for submitting the subject concept. It has been assigned the number listed above and a copy is attached for your file.

Your concept will be sent to the Concept Committee Members for review prior to the monthly Committee Meeting and also to "expert" reviewers who have knowledge in the particular field.

You will promptly be notified of any decisions reached by the Concept Committee:

** ***NOTICE*** **

If you know, or at any time in the future, have any knowledge of reduction to practice, lab and/or field test results and especially DATES OF SALES with the features of your concept, submit this information immediately to Patent Services. It is important that the appropriate, subject concept number be referenced on all such information so that it can be properly filed in your concept file.

You will receive a written letter of invitation to a future Concept Committee Meeting at which time you, or your designated representative, can explain the technical merits of the subject concept. A specific time will be assigned, allowing for a 5-minute presentation and a 5-minute questions and answer period.

If you have any questions regarding this concept, feel free to call Patent Services at (713) 233-5337.

:ml
attachment

Combine w/ 97-ME60

DISCLOSURE OF INVENTION

CONCEPT NO 98-ME8
Page 1 of
Date Docketed 2/9/98

Inventor's Name	Emp. #	Dept. #	Ext.	Supervisor
Ron Eyre	185	360	224	Nathan Anderson
David Truax				Roger Brown
Kesh Keshavan	001		241	Roger Brown

1. **TITLE:**
Cutting element with a canted design for improved braze contact area, lower residual stress, improved interfacial stress and better impact resistance.

2. **DESCRIPTION OF INVENTION:** (Attach additional sheets or drawings if necessary)
A cutting element typically used for matrix body drill bits in which the diamond table is canted so that there is increased braze area without sacrificing the positive effects of the thick (.0.040") diamond table as well as improving the interfacial stresses and impact resistance.

3. **LIST RELATED PRIOR ART PATENT NUMBERS** (This portion **MUST** be completed prior to submittal):
5,605,199
5,590,728
5,494,477

4. **PROBLEMS EXISTING WITH PRIOR ART:**
Polycrystalline diamond on a carbide substrate has been used for cutting and drilling for a long period of time for the following reasons.

- Improving impact resistance without sacrificing wear resistance of the diamond table.
- Focus on thicker diamond table without sacrificing impact, chipping, wear and delamination resistance.
- Focus on increasing the diamond volume exposed to the formation on the current carbide substrate without reducing braze strength or braze area on the bit body.

To accomplish the above, focus has been primarily through the optimization of the interface geometry (NPI) and process optimization. The number of nonplanar interface geometry related patents that have been issued in the last 3 - 4 years is amazing. The theme in general is all these patents is to improve the quality of the cutter by changing the stresses in the PCD during cooling due to thermal mismatch between the carbide and the PCD material. However, with the focus to thicker PCD no real thought has been given to cutter retention. As diamond table thicknesses continue to increase, the actual braze area of the cutters has decreased which poses a potential problem of cutter retention in the bit. Also, with the current bit design at 10 - 15° back rake, the normal force on the cutter at the cutting edge is at 10 - 15° angle from the interface. This causes higher stresses at the interface of the substrate and diamond causing a higher potential for delamination.

CONCEPT NO. _____

Page 2 of _____

5. **DESCRIBE HOW PROBLEMS ARE SOLVED BY PRESENT INVENTION AND OTHER ADVANTAGES:**

Due to the canted design, there is more available substrate braze area to enhance cutter retention. Also, a thicker diamond table can be obtained at the cutting region. Another feature with this design is the normal force at the cutting edge can be at a much higher angle thus minimizing the shear component of the stresses at the interface.

6. **DATES:**

A. Conception: Identify first sketch or drawing:

B. First Disclosure: To whom?:

How:

C. Reduction to practice, started:

Completed:

D. Lab or Field Test:
Results:

INVENTOR(S)

_____
Name Date
Date

_____
Name Date
Date

_____
Name Date
Date

EXPLAINED TO & UNDERSTOOD BY

_____
Name

_____
Name

_____
Name

CPH M277/31654

DISCLOSURE OF INVENTION

CONCEPT NO 98-MEG
Page 1 of _____
Date Docketed _____

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INVENTOR(S) **EXPLAINED TO & UNDERSTOOD BY**

_____ _____
Name Date Name
Date

_____ _____
Name Date Name
Date

_____ _____
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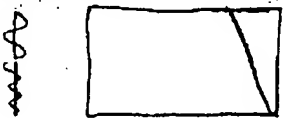
Dec 30, 1997

Shear Cutter Concepts

Concept 1

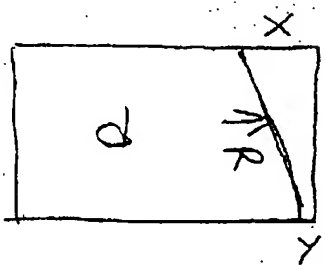
Interface

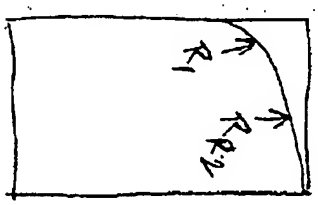


Variable Amplitude & Thickness

- Lower Residual Stress
- Improved Interfacial Stress
- Better Impact Resistant

Variables;



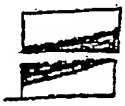


diameter

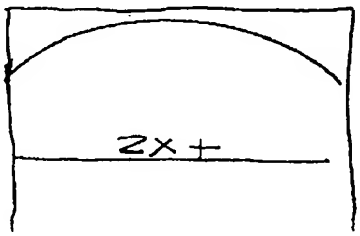
$$\frac{Y}{X} = \frac{100\ Mils}{100\ Mils} = \frac{100\ Mils}{30\ Mils} = \frac{100\ mils}{10\ mils}$$

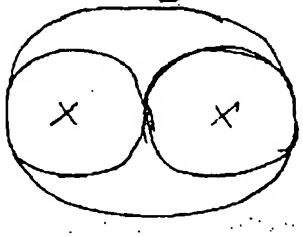
$R = \infty$

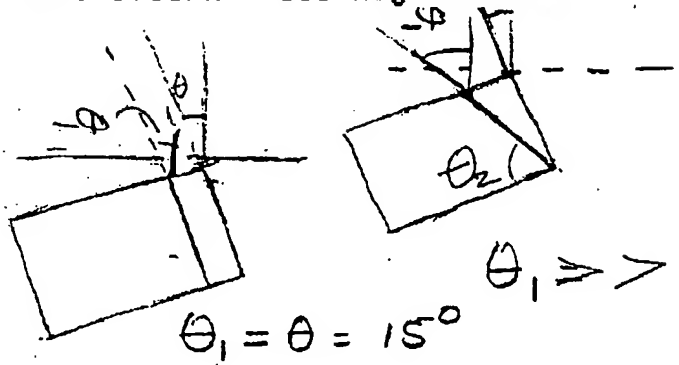
$= R_1\ R_2$ or Dual to obtain the thickness ratio

Press file orientation in Press  or 

Alternate Method of Making — Blank, Wire EDM and LS-bonding







$\theta_1 = \theta = 15^\circ$

Or 15° backRake

$\theta_1 >> \theta$ ~ 30 to 45 depends on angle θ_2.

With Current bit design at 10-15° backrake The normal force on the Cutter at the Cutting edge is at 10-15° angle from the Interface. However with the present Concept the normal force at the cutting edge could be at much higher angle thus minimizing shear component of the stresses at the Interface

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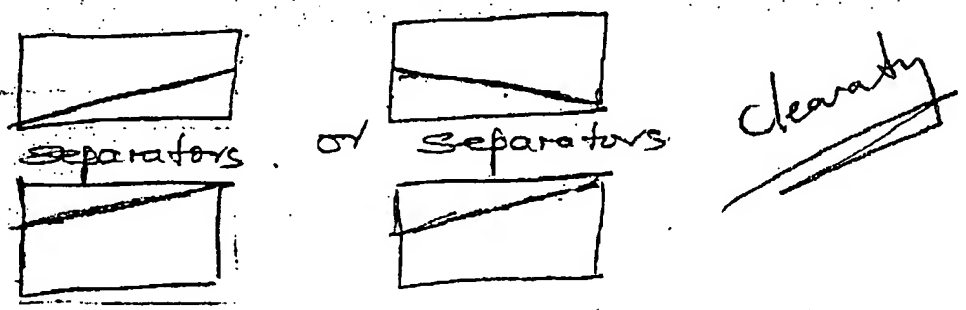
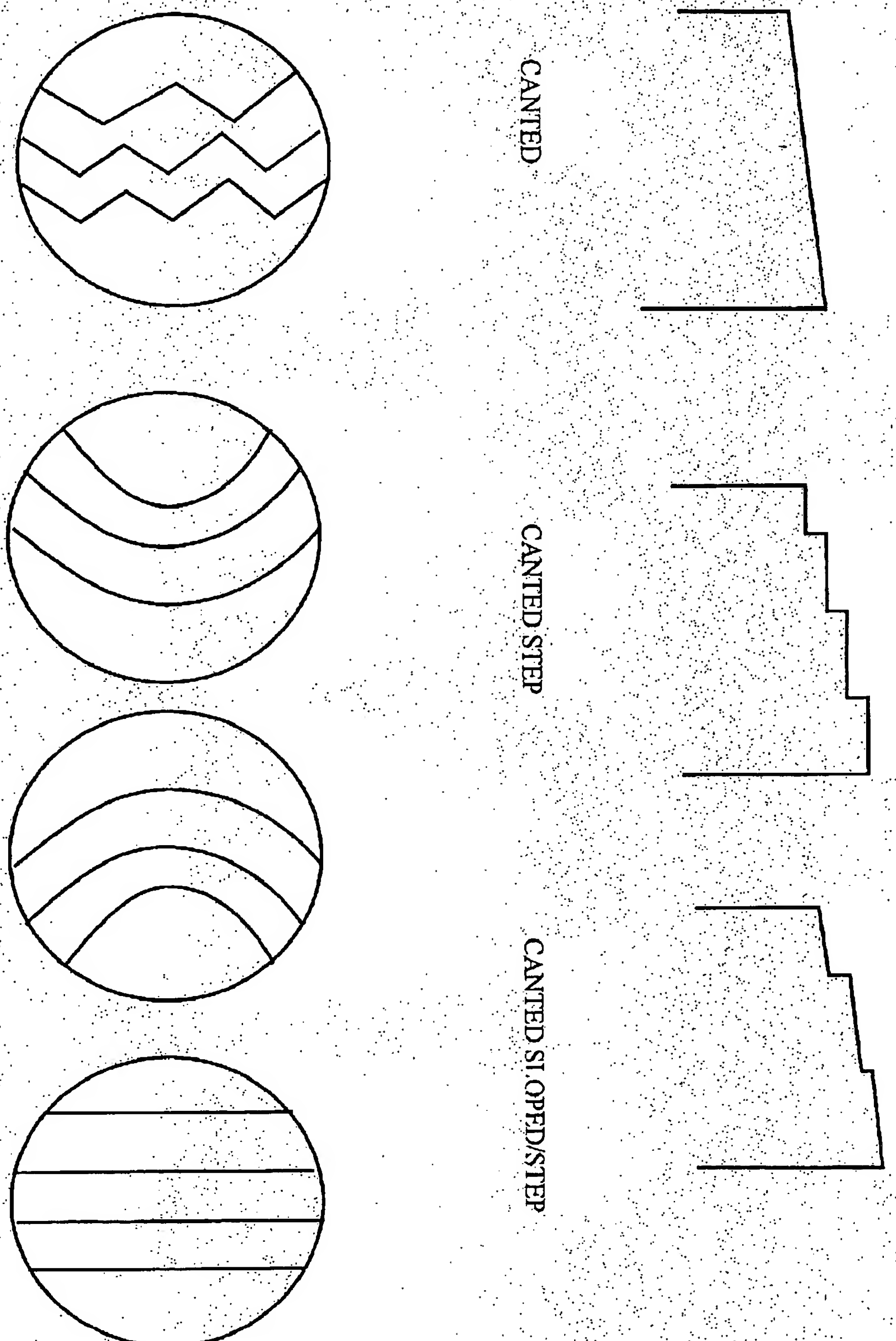
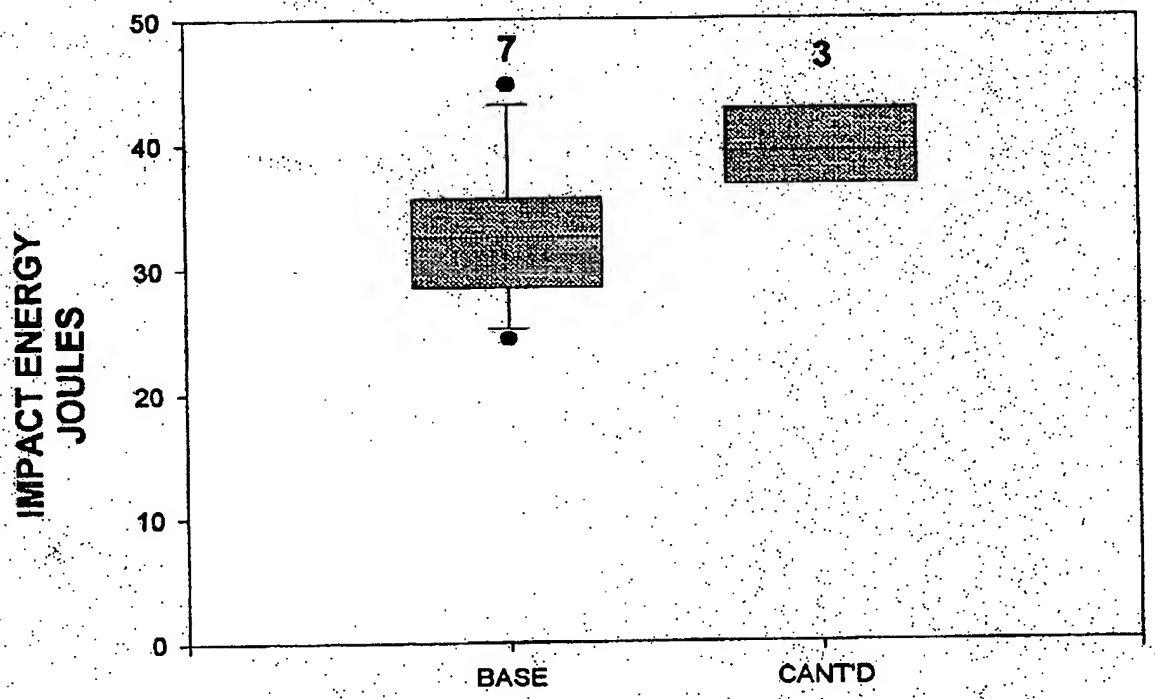
Method of Making





R. EYRE
98-ME8

DROP TOWER IMPACT TEST
ER8017-1
1313 CANTED



BIGGER IS BETTER

BASE) 1313STD TEC, X270,30/60 SMOOTH DOME
CANT'D) ER8017-1 1313 CANTED @ 5 DEG. X270, TEST AS LARGE SIDE UP